

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

Testa, Hurwitz & Thibault, LLP
Attn. Lanza, John D.
High Street Tower
125 High Street
Boston, MA 02110
UNITED STATES OF AMERICA

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT
OR THE DECLARATION

(PCT Rule 44.1)

Amend. Claims
DOCKETED
3.12.2000

Date of mailing
(day/month/year)

12/01/2000

Applicant's or agent's file reference

CTX-024PC

FOR FURTHER ACTION

See paragraphs 1 and 4 below

International application No.

PCT/US 99/17611

International filing date
(day/month/year)

04/08/1999

Applicant

CITRIX SYSTEMS, INC. et al.

1. ☒ The applicant is hereby notified that the International Search Report has been established and is transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

Where? Directly to the International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland
Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no International Search Report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Further action(s):** The applicant is reminded of the following:

Shortly after **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.

Within **19 months** from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within **20 months** from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the International Searching Authority



European Patent Office, P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Theresia Van Deursen

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions respectively.

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

What documents must/may accompany the amendments?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

"Statement under article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

It must be in the language in which the international application is to be published.

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, where upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference CTX-024PC	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/US 99/17611	International filing date (day/month/year) 04/08/1999	(Earliest) Priority Date (day/month/year) 14/08/1998
Applicant CITRIX SYSTEMS, INC. et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing:



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,



the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,



the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.



as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.



None of the figures.

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L29/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04L G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 414 624 A (IBM) 27 February 1991 (1991-02-27) column 4, line 12 -column 5, line 9 column 7, line 34 -column 8, line 10 column 8, line 36 -column 9, line 24 column 10, line 11-30 column 11, line 7-58 -----	1-20
A	EP 0 767 563 A (SUN MICROSYSTEMS INC) 9 April 1997 (1997-04-09) page 3, line 17-33 page 3, line 46 -page 4, line 27 page 5, line 47-58 figures 3,4 -----	1-20



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"Z" document member of the same patent family

Date of the actual completion of the international search

17 December 1999

Date of mailing of the international search report

12/01/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Lázaro López, M.L.

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0414624	A	27-02-1991	DE 69029441 D	30-01-1997
			DE 69029441 T	12-06-1997
			JP 2677343 B	17-11-1997
			JP 3090953 A	16-04-1991
			US 5218699 A	08-06-1993
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EP 0767563	A	09-04-1997	US 5758186 A	26-05-1998
			AU 6552196 A	10-04-1997
			CN 1159631 A	17-09-1997
			JP 9218860 A	19-08-1997
<hr/>				

PATENT COOPERATION TREATY

Express Mail Label No. EL749105178US
From the INTERNATIONAL BUREAU

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

To:

LANZA, John, D.
Testa, Hurwitz & Thibault, L.L.P.
High Street Tower
125 High Street
Boston, MA 02110
ÉTATS-UNIS D'AMÉRIQUE

RECEIVED

MAR 08 2000

F: Rev'd
3:8:00

Date of mailing (day/month/year) 24 February 2000 (24.02.00)		TESTA, HURWITZ & THIBAUT IMPORTANT NOTICE	
Applicant's or agent's file reference CTX-024PC			
International application No. PCT/US99/17611	International filing date (day/month/year) 04 August 1999 (04.08.99)	Priority date (day/month/year) 14 August 1998 (14.08.98)	
Applicant CITRIX SYSTEMS, INC. et al			

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
AU,CN,EP,IL,JP,KP,KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CR,CU,CZ,DE,DK,EA,EE,ES,FI,GB,GD,GE,GH,GM,
HR,HU,ID,IN,IS,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MD,MG,MK,MN,MW,MX,NO,NZ,OA,PL,PT,RO,
RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,UA,UG,UZ,VN,YU,ZA,ZW
The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on
24 February 2000 (24.02.00) under No. WO 00/10305

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 740.14.35	Authorized officer J. Zahra Telephone No. (41-22) 338.83.38
--	---

Inventor Information

Inventor One Given Name:: Henry
Family Name:: Collins
Name Suffix::
Postal Address Line One:: 6 Westover Road
Postal Address Line Two::
City:: High Wycombe
State or Province:: Bucks
Country:: United Kingdom
Postal or Zip Code:: HP 13 5HY
City of Residence:: High Wycombe
State or Prov. of Residence:: Bucks
Country of Residence:: United Kingdom
Citizenship Country:: United Kingdom

Correspondence Information

Correspondence Customer Number:: 021323
Electronic Mail::

Application Information

Title Line One:: Apparatus and Method for Extracting
Title Line Two:: Algorithmic Information From a Message Stream
Total Drawing Sheets:: 4
Formal Drawings?:: Yes
Application Type:: Utility
Docket Number:: CTX-024
Licensed US Govt. Agency::
Contract or Grant Numbers::
Secrecy Order in Parent Appl.?::

Representative Information

Representative Customer Number:: 021323

Continuity Information

This application is a:: 371 of
>Application One:: PCT/US99/17611
Filing Date:: August 4, 1999
Patent Number::
which is a:: Claims benefit of
>>Application Two:: 60/096,620
Filing Date:: August 14, 1998
Patent Number::

Prior Foreign Applications

Foreign Application One::
Filing Date::
Country::
Priority Claimed::

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference CTX-024PC	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/US 99/ 17611	International filing date (day/month/year) 04/08/1999	(Earliest) Priority Date (day/month/year) 14/08/1998
Applicant CITRIX SYSTEMS, INC. et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

☒ None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/US 99/17611

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04L29/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04L G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 414 624 A (IBM) 27 February 1991 (1991-02-27) column 4, line 12 -column 5, line 9 column 7, line 34 -column 8, line 10 column 8, line 36 -column 9, line 24 column 10, line 11-30 column 11, line 7-58 ---	1-20
A	EP 0 767 563 A (SUN MICROSYSTEMS INC) 9 April 1997 (1997-04-09) page 3, line 17-33 page 3, line 46 -page 4, line 27 page 5, line 47-58 figures 3,4 -----	1-20



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

17 December 1999

Date of mailing of the international search report

12/01/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Lázaro López, M.L.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/17611

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0414624 A	27-02-1991	DE 69029441 D	30-01-1997
		DE 69029441 T	12-06-1997
		JP 2677343 B	17-11-1997
		JP 3090953 A	16-04-1991
		US 5218699 A	08-06-1993

EP 0767563 A	09-04-1997	US 5758186 A	26-05-1998
		AU 6552196 A	10-04-1997
		CN 1159631 A	17-09-1997
		JP 9218860 A	19-08-1997

F. ENT COOPERATION TREA

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
 United States Patent and Trademark
 Office
 Box PCT
 Washington, D.C.20231
 ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 14 April 2000 (14.04.00)	Applicant's or agent's file reference CTX-024PC
International application No. PCT/US99/17611	Priority date (day/month/year) 14 August 1998 (14.08.98)
International filing date (day/month/year) 04 August 1999 (04.08.99)	
Applicant COLLINS, Henry	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
 06 March 2000 (06.03.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
 34, chemin des Colombettes
 1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer:

R. E. Stoffel

Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

REC'D 10 NOV 2000

WIPO

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

15

Applicant's or agent's file reference CTX-024PC		See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) FOR FURTHER ACTION	
International application No. PCT/US99/17611	International filing date (day/month/year) 04/08/1999	Priority date (day/month/year) 14/08/1998	
International Patent Classification (IPC) or national classification and IPC H04L29/06			
Applicant CITRIX SYSTEMS, INC. et al.			

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 9 sheets, including this cover sheet.

- ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 06/03/2000	Date of completion of this report 08.11.2000
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Huber, O Telephone No. +49 89 2399 8967 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/US99/17611

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.)*:

Description, pages:

1-9 as originally filed

Claims, No.:

1-20 as originally filed

Drawings, sheets:

1/4-4/4 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application.
☒ claims Nos. 1-5.

because:

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EXAMINATION REPORT**

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☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 1-5 are so unclear that no meaningful opinion could be formed (*specify*):

see separate sheet

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☐ no international search report has been established for the said claims Nos. .

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	6-20
	No:	Claims	
Inventive step (IS)	Yes:	Claims	6-20
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	6-20
	No:	Claims	

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

**INTERNATIONAL PRELIMINARY
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VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item III

Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. In respect to clarity of the plurality of independent claims, it should be noted that **only one independent claim in each category** (apparatus/method) is generally allowable (see Guidelines C-III, 3.3). The technical features of these independent claims have to correspond to each other which is the case for Claims 6-20, as they disclose the basic principle of the invention, but not for Claims 1-5.

Lack of clarity of the claims as a whole arises, since the plurality of independent claims makes it difficult, if not impossible, to determine the matter for which protection is sought, and places an undue burden on others seeking to establish the extent of the protection.

2. Independent **Claims 1-5** do not meet the requirement following from Article 6 PCT taken in combination with Rule 6 PCT that any independent claim must contain all the technical features essential to the invention.

Claims 1-5 do not include the features which are necessary to define the matter for which protection is sought in terms of the context of application of the claimed method. In this respect, the entire contents of the application (e.g. title; background of the invention and discussion of problems in the prior art; summary of the invention; detailed description; drawings) convey the impression that the claimed functions are to be carried out in the particular way associated with an system (Claim 19), as suggested by the description (page 2, lines 1-8).

The description provides a basis only for this specific context in which the invention is to be carried out, by including reiterated references to the application being directed to "...a method for extracting information from a message stream ..." (as the title recites, aimed at solving the problem of bandwidth consumption in a client-server communication (page 1, lines 14-22) (see also the drawings, as a further reference).

The scope of the claims should not be broader than justified by the extent of the description and drawings. Following from this, the scope of Claims 1-6 should have

specified that the claimed method finds its application within a **system for extracting algorithmic information from a message stream and transmitting the extracted information from a server to a client**. These features are hence essential to define the invention.

Furthermore, the application also sets an emphasis on the fact that the functionality of the claimed method and apparatus is responsive to an **algorithmic and parameter substream**, the relevance of this feature being repeatedly mentioned as background of the invention (pages 5-7), in the discussion of the problems to be solved by the invention, as well as in the "detailed description" and in the drawings.

These features seem to be covered already by Claims 6-20, so that Claims 1-5 relating to another method seem to be inappropriate, especially as a way to carry out the invention without any of these features has neither been explicitly disclosed in the original application (which does not ascribe to any of them an optional character), nor can it be derived from the disclosure by the skilled person without using inventive skill. Moreover, the provision of the missing features is necessary in order to provide a solution to the problems faced by the present application.

Therefore no opinion on Claims 1-5 is given in this report.

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

As far as the application can be understood (see Item VIII, 1.), the Claims 6-20 seem to involve an inventive step:

1) Closest Prior Art and its Problem

As defined in detail in the opening part of Claim 6, the invention relates to a method for extracting algorithmic information from a message stream, transmitting said extracted information from a server to a remote client.

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This preamble is based on the disclosure of the closest prior art document D1 = EP-A2-0 414 624.

The distributed system described in D1 is used for executing remote procedures of an application and returning its result to the application program.

The problem of the system in D1 is, that there are no adapted methods for transmitting the requests which consume less bandwidth.

The state of the art does not show any apparatus, which would be able to perform the low resource consuming message transfer mechanism as explained in the present application.

2) Object of the Invention

The object of the present invention is to provide a method (Claim 1), an apparatus (Claim 13) and a system (Claim 18) for reducing the amount of bandwidth, which is required for client server communication in a distributed system, in particular for transmitting graphical user interface elements.

3) Solution

The solution is characterised in that the message is decomposed into sub-streams, one which represents algorithmic information and another sub-stream which represents parameter information.

By the above-constitution of the present invention, the total amount of data is reduced advantageously, leading to quicker response as less resources are required for operation.

4) Conclusion and General Remarks

The solution to this problem proposed the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

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The concept of the method for extracting algorithmic information, according to Claim 6, the corresponding apparatus (Claim 13) and system (Claim 18) are not disclosed in or rendered obvious by the documents cited in the International Search Report.

Claims 7-12, 14-17 and 19-20 are dependent on Claims 6, 13 and 18 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

In D2 = EP-A2-0 767 563 a method for multi protocol operation in a client/server system is presented, which is able to encode each method call with a different communication protocol, but lacks the possibility of splitting the algorithmic part of a message from its parameter part in order to reduce the amount of data to be transmitted.

Claims 6-20 are novel, inventive and industrially applicable.

Re Item VII

Certain defects in the international application

1. The independent Claims are not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (document **D1**) being placed in a preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in a characterising part (Rule 6.3(b)(ii) PCT).
2. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document **D1** is not mentioned in the description, nor is this document identified therein.
3. The description is not in conformity with the claims as required by Rule 5.1(a)(iii) PCT. In particular the objective technical problem of the state of the art D1, solved by the characterizing part of the application, is not pointed out.
4. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

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Re Item VIII

Certain observations on the international application

1. It is clear from the description on page 2, lines 1-8, page 6, line 31 - page 7, line 3 and page 8, line 32 - page 9, line 2 (see also Item III, 2.) that the following features are essential to the definition of the invention:

- (1) "One of the substreams represents algorithmic information"
- (2) "Another substream represents parameter information"

Since the independent claims 6, 13 and 18 do not contain these features they do not meet the requirement following from Article 6 PCT taken in combination with Rule 6.3(b) PCT that any independent claim must contain all the technical features essential to the definition of the invention.

In order to overcome this objection in a future regional/national phase, it seems appropriate to combine Claims 6, 13 and 18 with dependent Claims 7, 14 and 19, in order to include the missing features, without extending the Claims beyond the disclosure of the application as a whole.

2. The vague statement in the description on page 9, lines 17-20, referring to the "spirit of the invention" implies that the subject-matter for which protection is sought may be different to that defined by the claims, thereby resulting in lack of clarity (Article 6 PCT) when used to interpret them (see also the PCT Guidelines, PCT/GL/3 III, 4.3a). These statements should be removed from the description.

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(21) International Application Number: PCT/US99/17611 (22) International Filing Date: 4 August 1999 (04.08.99) (30) Priority Data: 60/096,620 14 August 1998 (14.08.98) US (71) Applicant (for all designated States except US): CITRIX SYSTEMS, INC. [US/US]; 6400 NW 6th Way, Fort Lauderdale, FL 33309 (US). (72) Inventor; and (75) Inventor/Applicant (for US only): COLLINS, Henry [GB/GB]; 6 Westover Road, High Wycombe, Buckinghamshire HP13 5HY (GB). (74) Agent: LANZA, John, D.; Testa, Hurwitz & Thibault, L.L.P., High Street Tower, 125 High Street, Boston, MA 02110 (US).			(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
(54) Title: APPARATUS AND METHOD FOR EXTRACTING ALGORITHMIC INFORMATION FROM A MESSAGE STREAM			
(57) Abstract A method for extracting algorithmic information from a message having associated arguments, each argument having an associated value, includes the step of identifying the message as algorithmic information. The first time the value of an argument is encountered, it is identified as parameter information. Each subsequent time the value of the argument is encountered it is identified as algorithmic information. A corresponding system and method is also described.			

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APPARATUS AND METHOD FOR EXTRACTING ALGORITHMIC INFORMATION FROM A MESSAGE STREAM

Field of the Invention

The present invention relates to data communication apparatus and methods and, in particular, to apparatus and methods for extracting algorithmic information from a stream of messages so that a message stream containing algorithmic information may be transmitted more efficiently.

Background of the Invention

Distributed computer systems, in which a client node is typically remote from a server, utilize the technique of distributing execution of an application. More specifically, an application server provides application execution services, such as application processing or access to files and other resources, to client nodes instead of the client nodes providing those services. Client nodes are generally cheaper than servers, and since one server typically provides services to more than one client, overall system cost is reduced. Additionally, client-server systems allow decisions regarding the location of certain system resources (such as applications) to be made on a situational basis. Unfortunately, the amount of bandwidth required to transmit graphical user interface elements can easily exceed the bandwidth provided by relatively high bandwidth transport mechanisms such as Ethernet.

The growing collection of networked computers commonly referred to as "the Internet" allows a natural and compelling extension of the flexibility and power provided by client-server, distributed systems. In this extension, any "node" may act as a client that receives application output from a remote "server." Unfortunately, the relatively low bandwidth of Internet connections exacerbates the bandwidth consumption problems described above and makes widespread use of such a system problematic, even with traditional data compression techniques.

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Summary of the Invention

The present invention allows a message stream to be decomposed by a transmitting node into one or more sub-streams by a transmitting node and regenerated by a receiving node so that the total network traffic between the two nodes is less than would be required to transmit the message stream in the first instance. One of the sub-streams represents algorithmic information, that is, some portion of the message stream represents repetitive or recurring strings or data values. Another sub-stream represents parameter information, which is data that does not repeat or recur throughout the message stream. Traditional compression techniques may be applied to the sub-streams to further reduce the amount of bandwidth necessary to communicate them between nodes.

In one aspect, the present invention relates to a method for extracting algorithmic information from a message having associated arguments. Each argument has an associated value. The message is identified as algorithmic information. The first time the value of an argument is encountered, it is identified as parameter information. Each subsequent time the value of the argument is encountered it is identified as algorithmic information.

In another aspect the present invention relates to a method for extracting algorithmic information from a message having associated arguments, each argument having an associated value. The extracted information is transmitted from a server to a remote client. The method includes the step of identifying, at the server, a message as algorithmic information. A message identifier is stored in an algorithmic information list. At the server a value of an argument associated with the message is identified as parameter information the first time the data value is encountered. Each subsequent time the data value is encountered it is identified as algorithmic information and a value identifier is stored in the algorithmic information list.

In yet another aspect, the present invention relates to an apparatus for extracting algorithmic information from a message having associated arguments, each of the associated arguments having an associated value. The apparatus includes a transmitter in electrical communication with a network connection that transmits algorithmic information over the network connection. The apparatus also includes an extractor which separates a message into algorithmic information and value information. The algorithmic information is stored in an algorithmic sub-stream and the value information is stored in a parametric sub-stream. Both sub-streams are stored in a memory element.

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In still another aspect the present invention relates to a system for extracting algorithmic information from a message having associated arguments. Each one of the associated arguments has an associated value. The extracted information is transmitted from a server to a client over a network connection. The system includes a client and a server. The client includes a receiver in electrical communication with the network connection that receives algorithmic information transmitted over the network connection. The server includes a transmitter in electrical connection with the network connection that transmits algorithmic information over the connection. The server also includes an extractor which separates a message into algorithmic information and value information. The algorithmic and value information is stored in a memory element.

Brief Description of the Drawings

The invention is pointed out with particularity in the appended claims. The advantages of the invention described above, and further advantages, may be better understood by reference to the following description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a block diagram of a distributed computer system;

FIG. 2 is a flowchart of one embodiment of the steps taken to extract algorithmic information from a message stream;

FIG. 3 is a flowchart of the steps to be taken in one embodiment of a heuristic; and

FIG. 4 is a block diagram of an apparatus for extracting algorithmic information from a message stream.

Detailed Description of the Invention

FIG. 1 is a schematic diagram of a distributed computer system incorporating the invention. The system includes a server node 10 coupled to a transport system 12 (e.g., serial lines, telephone lines, a local area network, a wide area network, or a wireless communication medium). Although only one server node 10 is shown in FIG. 1, it is understood that more than one server node 10 may be provided. The application servers 14 provide application execution services to network client nodes 16. In some embodiments each server node 10 provides a single application server 14, instead of the multiple application servers 14 depicted in FIG. 1.

In some embodiments, the system described in FIG. 1 is a traditional client-server system operating over a local area network such as Ethernet, which provides a bandwidth up to

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substantially 10 Megabits per second (Mbps). In other embodiments, the transport mechanism, such as a serial connection over twisted copper-pair wiring typical in connections between Internet nodes, provides low bandwidth. Client nodes 16 may be located remotely from application servers 14 and communicate at a rate of 56 Kilobits per second (Kbps). In certain of these embodiments the client nodes 16 and application servers 14 communicate at a rate of 28.8 Kbps. In further of these embodiments the client nodes 16 and application servers 14 communicate at a rate of 9.6 Kbps or 2.4 Kbps.

When a client node 16 wishes to run an application, the application server 14 intercepts the user interface data of the client node 16 (e.g., the display screen, keyboard, and mouse) and transmits/receives this data to/from a user program running at the client node 16. For applications in which the application server 14 intercepts a graphical user interface, the application server 14 intercepts and transmits various graphic elements such as lines, arcs, ellipses, or bezier curves. In some embodiments the application server 14 communicates graphical user interface data to a client node 16 using one or more messages. The techniques described below may be advantageously used with any protocol that results in a message stream between nodes, including but not limited to: the X Windows protocol; the Serial Line Interface Protocol; the Point To Point protocol; the Independent Computing Architecture (ICA) protocol, manufactured by Citrix Systems of Fort Lauderdale, Florida; the PostScript printing and display protocol; the QuickDraw protocol, manufactured by Apple Computer of Cupertino, California; or the Graphic Device Interface (GDI) protocol, manufactured by Microsoft Corporation of Redmond, Washington.

Table 1 below shows a message stream that may be sent from an application server 14 to a client node 16 to instruct the client node 16 to draw a rectangular graphic user interface element.

Table 1

draw_line (0,0,0,100)
draw_line (0,100,100,100)
draw_line (100,100,0,100)
draw_line (0,100,0,0)

In the example described above, the draw_line command instructs a client node 16 to draw a straight line from at a starting point to an ending point. The first draw_line command in Table 1

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instructs a node to draw a line beginning at an x-y coordinate location of (0,0) and ending at an x-y coordinate location of (0,100).

Referring now to FIG. 2, the server 14 begins extraction of algorithmic data by getting the next logical element from the message stream (step 202). A logical element is any data in the message stream that has inherent meaning, such as the draw_line messages, the x coordinate location values, and the y-coordinate location values. The next logical element may be stored in a convenient memory element from which the server 14 retrieves it. For example, the server 14 may store messages as they are generated by an application and retrieve them later for processing. Alternatively, the server 14 may receive the next logical element and process it in "real-time." In these embodiments the server 14 may receive multiple logical elements at a time.

The server 14 may use any number of techniques to identify logical elements. For example, the server 14 may be configured with knowledge of the protocol used to generate the message stream. Such knowledge would allow the server 14 to easily identify messages and arguments associated with those messages. In one embodiment the server 14 maintains a look-up table containing all messages provided by the protocol. In this embodiment the server 14 identifies messages by comparing a logical element to the look-up table. Once a message has been identified, the server 14 can identify data values based on the parameters expected to accompany the message, e.g., two byte-long arguments may follow a particular message.

Once the server 14 has gotten the next logical element, the server 14 uses a heuristic to identify algorithmic data based on the type of logical element the server 14 is processing (step 204). For example, a message may always be determined to be algorithmic information. As another example, the most recently encountered y-coordinate values could be compared to determine if a simple, commonly occurring relationship between those y-coordinate values exists. If such a relationship exists, then the y-coordinate value is identified as algorithmic information. In general, the function of the heuristic is to express a type of data value algorithmically as some function of the previous occurrences of the data value in the message stream. Examples of such relationships include, but are not limited to, that the most recently received y-coordinate value: is equal to the last encountered y-coordinate value; is one greater than the last received y-coordinate value; or is equal to the last received value plus a small delta.

The algorithmic encoding for the element is placed into an algorithmic sub-stream (step 206), even if the encoding specifies that no relationship could be identified. The algorithmic sub-stream stores the algorithmic data identified by the server 14. In one embodiment the

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algorithmic sub-stream comprises a stack memory structure. In other embodiments, the algorithmic sub-stream is provided as a portion of random access memory. The algorithmic sub-stream may also be provided as a doubly-linked list, a singly-linked list, a queue memory structure, or an array.

- 5 The heuristic should also define the meanings of any algorithmic encodings it places into the algorithmic sub-stream. That is, the server 14 and client node 16 must both understand what a particular algorithmic encoding represents so that the client node 16 is able to reverse the extraction process. Thus, the encodings placed in the algorithmic sub-stream identify the formula or algorithm that can be used by the client node 16 to reconstruct the message stream.
- 10 Using the message stream of Table 1 as an example, the first three coordinate locations encountered by the server 14 have a value of zero. The second and third coordinate value locations may be represented in the algorithmic sub-stream by an encoding identifying them as having the same value as the first coordinate value.

- If the algorithmic encoding does not fully define the data value of the logical element
- 15 (step 208), parameter information is placed in the parameter sub-stream (step 210). The parameter information is the residual information necessary to regenerate the data value. For example, in a case where the algorithmic data indicates that no algorithm for expressing the data value could be identified, the actual data value must be added to parametric sub-stream. In another example, if an algorithmic encoding is placed in the algorithmic sub-stream indicating
- 20 that current data value is the same as the immediately previous data value plus a small delta, the value of the small delta must be placed in the parametric sub-stream.

- The server 14 determines if there are more logical elements of the message stream to process (step 212). For embodiments in which the message stream is stored in a memory structure, this may be done by checking to see if the memory is empty or if the end of the
- 25 particular memory structure has been reached. For embodiments in which messages are received as they are generated, a message may include some information that signals it is the last message. If more messages remain to be processed, then the server 14 gets the next logical element in the message stream (step 202). If not, then the server 14 is done (step 214). For embodiments in which the server 14 receives messages as they are generated the server 14 may, in step 214, wait
- 30 to receive new messages using some form of looping or interrupt mechanism.

 Once the server 14 has constructed the algorithmic and parametric sub-streams, those sub-streams are transmitted to the client node 16. The client node 16 reconstructs the message

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stream by using each formula from the algorithmic sub-stream. The client node 16 uses each formula to regenerate the values of the logical items in the message stream, consuming data values from the parametric sub-stream as directed by the formulae.

In one embodiment the algorithmic and parametric sub-streams may be further
5 compressed before transmission to the client node 16. An exemplary compression algorithm that could be used to further compress the sub-streams is Lempel-Ziv-77 and its derivatives. In other embodiments the server 14 stores the sub-streams it transmits to the client node 16 in a buffer and the client node 16 stores the sub-streams received from the server 14 in a buffer. In this embodiment, the server 14 compares a sub-stream to the server buffer before transmitting the
10 sub-stream to the client node 16. If the sub-stream matches an entry in the buffer, then the server 14 has previously transmitted the sub-stream to the client node 16. The server 14 transmits a glyph to the client node 16 that indicates the starting point in the buffer and length of the match instead of the sub-stream itself. An alternative compression technique which may be used is described in United States Patent Application Serial No. 09/084,838, filed May 26, 1998, the
15 contents of which are incorporated herein by reference.

Referring now to FIG. 3, a particular heuristic for separating algorithmic data and parametric data will be discussed. The particular heuristic depicted by FIG. 3 is particularly suited for algorithmic data extracted from a message stream composed of drawing commands, such as the message stream shown in Table 1. In this embodiment, the server 14 gets the next
20 logical element in the message stream (Step 202, FIG. 2) and determines if the logical element is a message (step 302). The server 14 can determine if the logical element is a message by comparing the element to a look-up table containing a representation of all messages provided by the protocol. Alternatively, messages may be indicated by a bit or flag embedded in the message stream. If the server 14 determines that the logical element is a message, the server inserts an
25 algorithmic encoding identifying the message into the algorithmic sub-stream (step 308).

If the server 14 determines that the logical element is not a message, the element is a data value. The server 14 attempts to determine if this is the first time the data value has been encountered (step 304). If not, the data value can be represented as algorithmic data and an entry is placed into the algorithmic sub-stream (step 308) indicating that the current data value has
30 been previously received. If, however, the current data value has never been received, then the server 14 places an algorithmic encoding into the algorithmic data stream indicating that a new

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data value has been encountered (step 310) and the data value is placed into the parametric sub-stream (step 312).

Referring now to FIG. 4 an apparatus 40 for extracting algorithmic information from a message stream includes a transmitter 42, an extractor 44, a memory element 46 in electrical communication with the extractor 44 and the transmitter 42, and an optional compressor 48 (shown in phantom view). The extractor 44 operates on one or more messages to separate algorithmic data from parametric data. Extractor 44 may be in electrical communication with a memory element storing the messages (not shown). In other embodiments, the extractor 44 is in direct electrical communication with the source of the messages. Extractor 44 is in electrical communication with a memory element 46. The extractor 44 stores algorithmic sub-streams and parametric sub-streams in the memory element 46 for eventual transmission to a client node 16. Memory element 46 may be a structured memory element such as a stack or queue. Alternatively, memory element 46 may be provided as random access memory. If the memory element 46 is random access memory, it may be configured to provide a structured memory element for storing the sub-streams produced by the extractor 44. A transmitter 42 is in electrical communication with the memory element 46. The transmitter is also in electrical communication with a network connection (not shown) which allows it to transmit the algorithmic and parametric sub-streams produced by the extractor 44. The transmitter 42 drives the sub-streams over the network connection to a client node 16. The transmitter 42 may be one or more transceivers embodied as integrated circuits which connect to the network connection via a port. Alternatively, the transmitter 42 may be a stand-alone device such as a modem.

In some embodiments, the apparatus 40 includes a compressor 48 in electrical communication with the memory element 46 and the transmitter 42. The compressor 48 compresses the sub-streams stored in the memory element 46 before they are transmitted to a client node 16 by the transmitter 42. The compressor 48 may use any form of data compression such as Lempel-Ziv-77 and its derivatives.

The apparatus depicted in FIG. 4 may also be used to reconstruct the message stream. In this embodiment, the transmitter 42 is a transceiver capable of receiving sub-streams driven over the network connection. The transceiver 42 receives the sub-streams and stores them in the memory element 46. For embodiments in which compression is used, the transmitter 42 provides the received sub-streams to the compressor 48 which decompresses the compressed sub-streams and stores them in the memory element 46. Extractor 44 then reconstructs the

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message stream using the algorithmic sub-stream and the parametric sub-stream stored in the memory element 46. Thus, a system may be provided in which servers 14 reduce message streams to one or more sub-streams and transmit those sub-streams over a network connection to a client node 16. The client node 16 receives the transmitted sub-streams and reconstructs the original message stream.

In some embodiments, the functionality described above may be implemented as software executing on a general purpose computer. For example, such a program may set aside portions of the computer's random access memory to provide the algorithmic and parametric sub-streams. Program logic may be used to effect the determinations described above. In such an embodiment, the program may be written in any one of a number of high level languages such as FORTRAN, PASCAL, C, C++, or BASIC. Additionally, the software could be implemented in an assembly language directed to the microprocessor resident on the target computer, for example, the software could be implemented in Intel 80x86 assembly language if it were configured to run on an IBM PC or PC clone. The software may be embodied on an article of manufacture including, but not limited to, a floppy disk, a hard disk, an optical disk, a magnetic tape, a PROM, an EPROM, EEPROM, field-programmable gate array, or CD-ROM.

Having described certain embodiments of the invention, it will now become apparent to one of ordinary skill in the art that other embodiments incorporating the concepts of the invention may be used. Therefore, the invention should not be limited to certain embodiments, but rather should be limited only by the spirit and scope of the following claims.

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CLAIMS

What is claimed is:

- 1 1. A method for extracting algorithmic information from a message stream, each message
2 having associated arguments and each argument having an associated value, the method
3 comprising the steps of:
 - 4 (a) identifying a message as algorithmic information;
 - 5 (b) identifying the value of an argument as parameter information the first time the
6 value is encountered; and
 - 7 (c) identifying the value of the argument as algorithmic information each subsequent
8 time the value is encountered.
- 1 2. The method of claim 1 wherein step (b) further comprises the steps of:
 - 2 (b-a) identifying the value of an argument as parameter information the first time the
3 value is encountered; and
 - 4 (b-b) storing the identified value in an associated memory element.
- 1 3. The method of claim 2 wherein step (b-b) comprises storing the identified argument in a
2 stack memory element.
- 1 4. The method of claim 1 further comprising the steps of storing a message identifier in an
2 algorithmic sub-stream when a message is encountered and storing an argument identifier in the
3 algorithmic sub-stream when a value of an argument is encountered subsequent to the first time.
- 1 5. The method of claim 2 further comprising the steps of storing a message identifier in an
2 algorithmic sub-stream when a message is encountered and storing a value identifier in the
3 algorithmic sub-stream when a value of an argument is encountered subsequent to the first time,
4 the value identifier comprising the location of the value in the associated memory element.
- 1 6. A method for extracting algorithmic information from a message stream, each message
2 having associated arguments and each argument having an associated value, and transmitting the
3 extracted information from a server to a remote client, the method comprising the steps of:
 - 4 (a) identifying, at the server, a message as algorithmic information;
 - 5 (b) storing a message identifier in an algorithmic sub-stream;
 - 6 (c) identifying, at the server, a value of an argument associated with the message as

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7 parameter information the first time the value is encountered; and

8 (d) identifying, at the server, the value as algorithmic information each subsequent
9 time the value is encountered.

1 7. The method of claim 6 wherein step (c) comprises:

2 (c-a) identifying, at the server, a value of an argument associated with the message as
3 parameter information the first time the value is encountered; and

4 (c-b) storing a parameter identifier in a parametric sub-stream.

1 8. The method of claim 7 further comprising the step of compressing the parametric sub-
2 stream.

1 9. The method of claim 6 wherein step (d) further comprises:

2 (d-a) identifying, at the server, the value as algorithmic information each subsequent
3 time the value is encountered; and

4 (d-b) storing an algorithmic identifier in the algorithmic sub-stream.

1 10. The method of claim 9 further comprising the step of compressing the algorithmic sub-
2 stream.

1 11. The method of claim 6 further comprising the step of transmitting the algorithmic sub-
2 stream.

1 12. The method of claim 7 further comprising the step of transmitting the parametric sub-
2 stream.

1 13. An apparatus for extracting algorithmic information from a message stream, each
2 message having associated arguments and each argument having an associated value, and
3 transmitting the extracted information via a network connection, the apparatus comprising:

4 a transmitter in electrical communication with a network connection;

5 a memory element in electrical communication with said transmitter, said memory
6 element providing storage for an algorithmic sub-stream and a parametric sub-stream;

7 an extractor in electrical communication with said memory element, said extractor
8 separating a message having associated arguments into algorithmic information and value

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9 information and storing the algorithmic information in an algorithmic sub-stream;

10 wherein said transmitter transmits the algorithmic sub-stream.

1 14. The apparatus of claim 13 wherein said extractor stores the value information in a
2 parametric sub-stream.

1 15. The apparatus of claim 13 wherein said transmitter transmits the parametric sub-stream.

1 16. The apparatus of claim 13 wherein said memory element comprises a stack data structure.

1 17. The apparatus of claim 13 further comprising a compressor in electrical communication
2 with said memory element and said transmitter, said compressor compressing the algorithmic
3 sub-stream.

1 18. A system for extracting algorithmic information from a message stream, each message
2 having associated arguments and each argument having an associated value, and transmitting the
3 extracted information from a server to a client via a connection, the system comprising:

4 a client including:

5 a receiver in electrical communication with the connection, the receiver receiving
6 algorithmic information transmitted over the connection; and

7 a server including:

8 a transmitter in electrical communication with the connection, the transmitter
9 transmitting algorithmic information over the connection;

10 an extractor separating a message having associated arguments into algorithmic
11 information and value information; and

12 a memory element in electrical communication with said extractor, said memory
13 element storing an algorithmic sub-stream including algorithmic information separated by said
14 extractor.

1 19. The system of claim 18 wherein said client further includes a client memory element in
2 electrical communication with said receiver, said client memory element storing algorithmic and
3 parametric sub-streams transmitted by said server.

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- 1 20. The system of claim 19 wherein said client further includes an extractor in electrical
- 2 communication with said client memory element, said client extractor producing the message
- 3 from the algorithmic and parametric sub-streams.

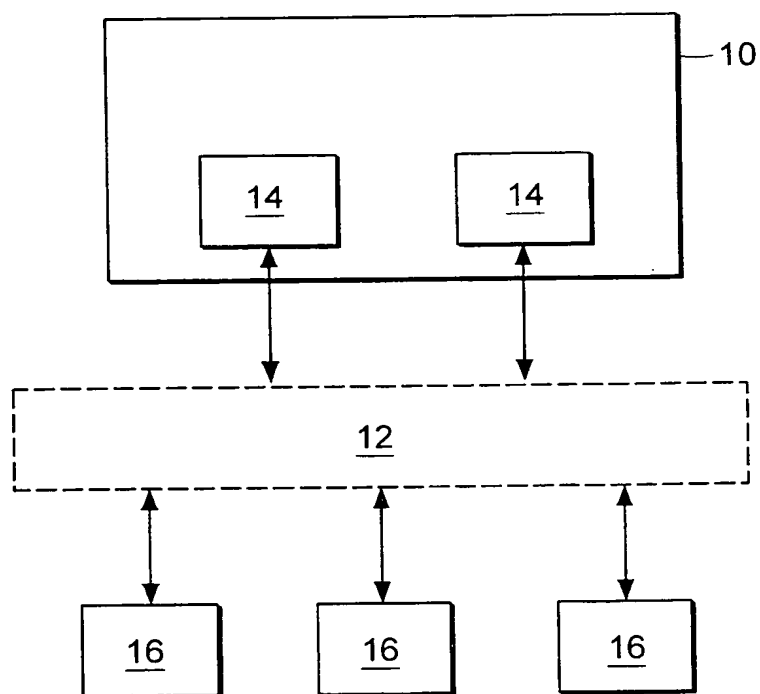


FIG. 1

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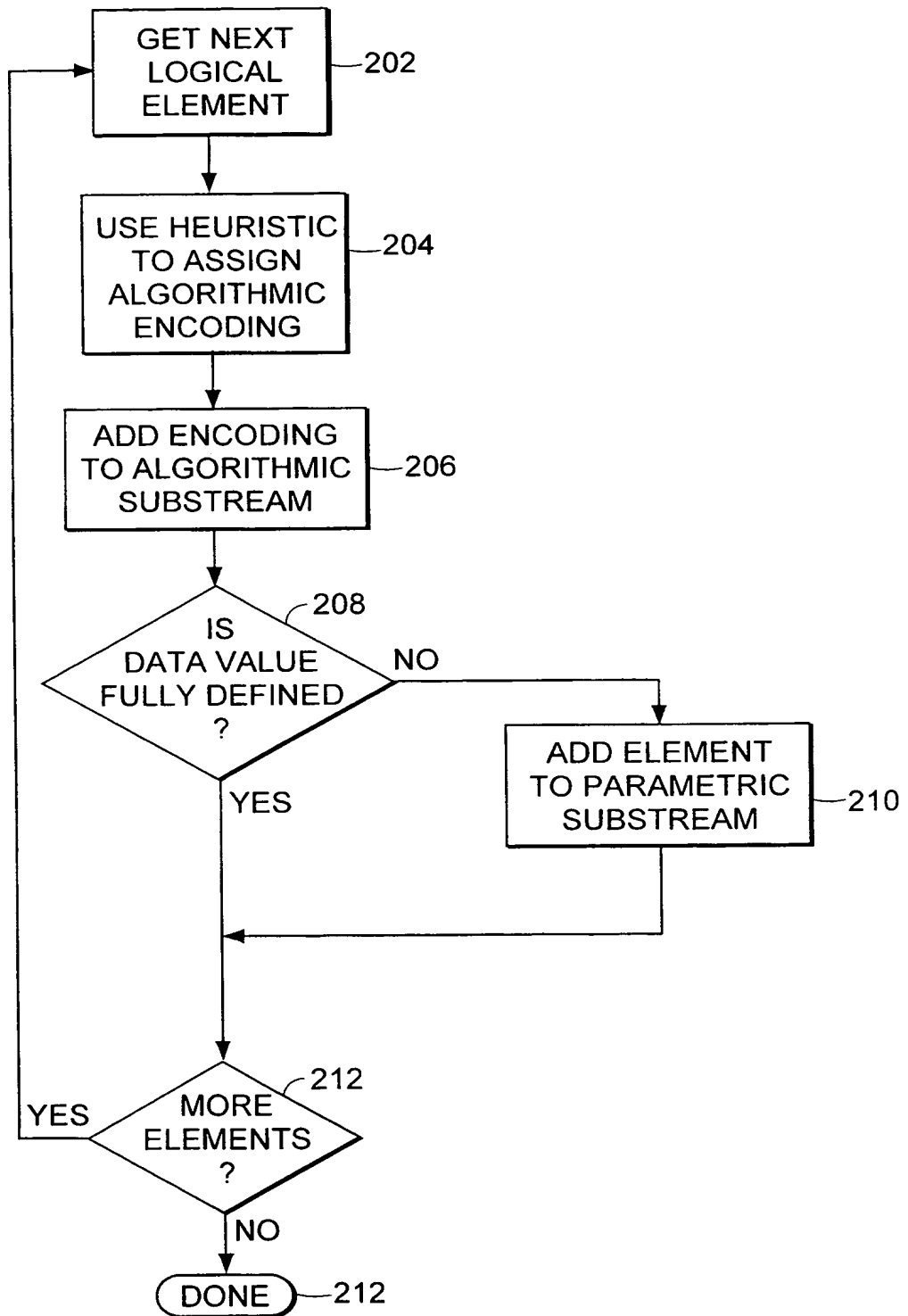


FIG. 2

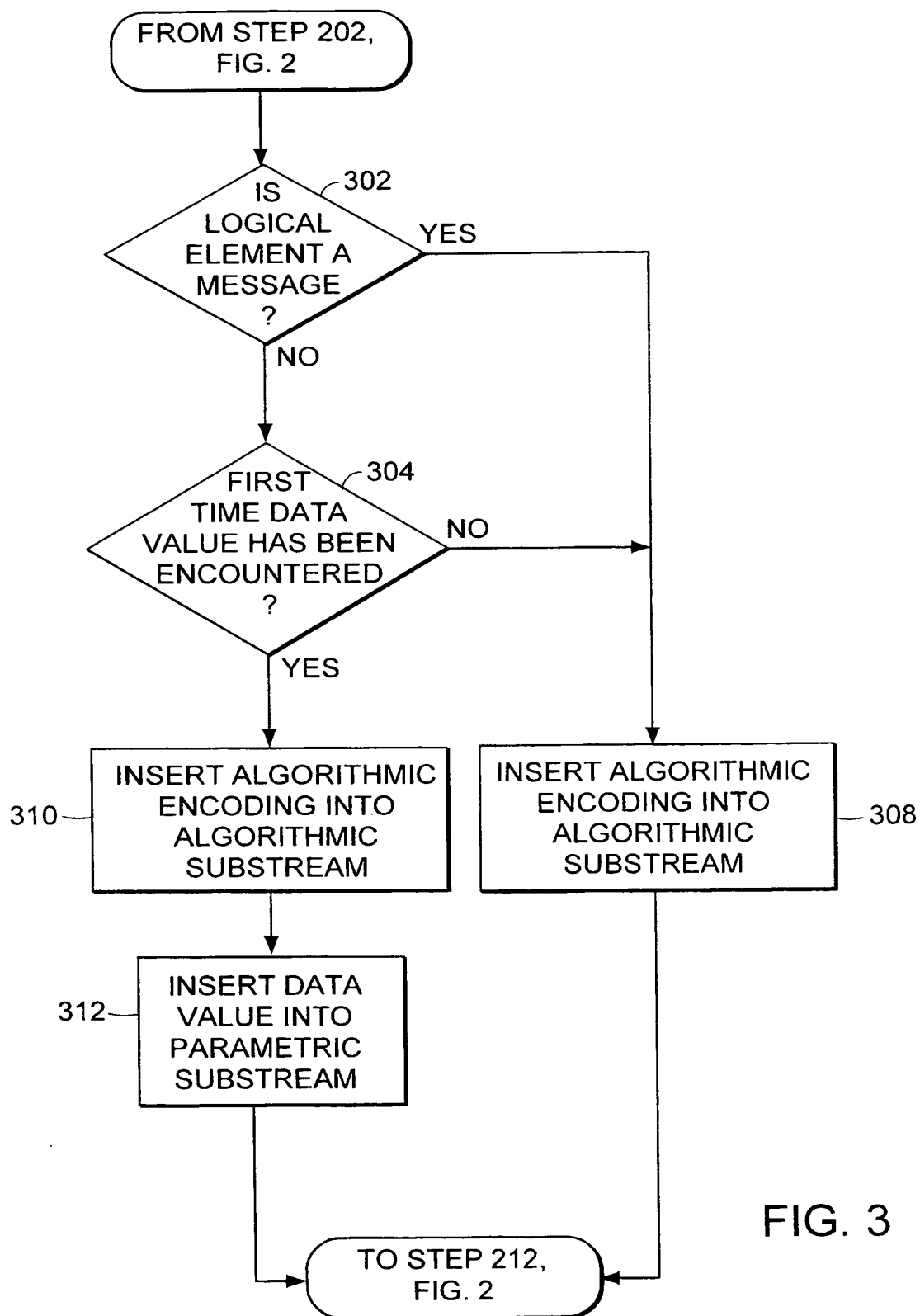


FIG. 3

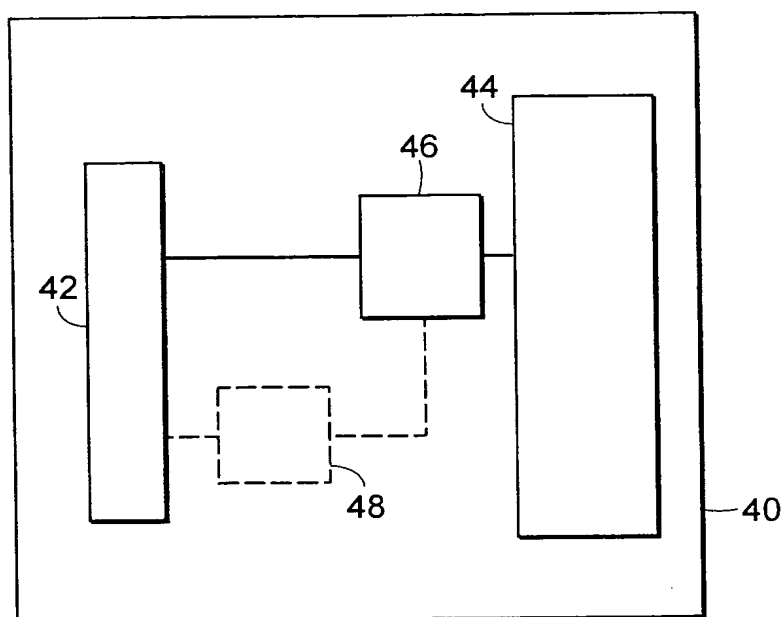


FIG. 4

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/17611

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L29/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04L G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 414 624 A (IBM) 27 February 1991 (1991-02-27) column 4, line 12 -column 5, line 9 column 7, line 34 -column 8, line 10 column 8, line 36 -column 9, line 24 column 10, line 11-30 column 11, line 7-58	1-20
A	EP 0 767 563 A (SUN MICROSYSTEMS INC) 9 April 1997 (1997-04-09) page 3, line 17-33 page 3, line 46 -page 4, line 27 page 5, line 47-58 figures 3,4	1-20

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
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- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/17611

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